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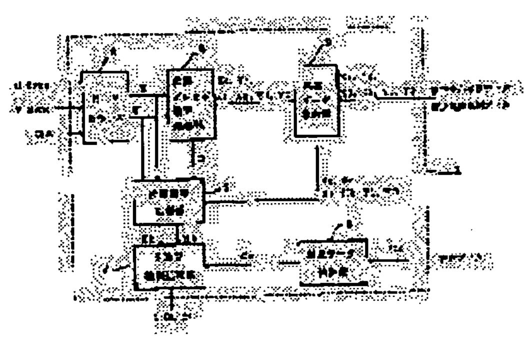
(54) IMAGE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To correct luminance and chrominance unevenness caused in a valid screen.
SOLUTION: A position block specific processing section 4 sets a correction area based on correction center coordinate data and correction range coordinate data stored in a coordinate data storage section 3 and divides the correction area into four rectangular areas by taking a correction center point of the correction area in common. A position arithmetic processing section 5 discriminates at which of the four rectangular area blocks a pixel subject to correction processing is placed and locates the position of the pixels in the discriminated block as address data. Then a 2-dimension interpolation processing section 7 applies interpolation processing to each pixel in the correction area based on the correction data that are stored in a correction data storage section 6 and correct the correction center point and on the address data obtained by the position arithmetic processing section 5.



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CLAIMS

[Claim(s)]
[Claim 1] Image display equipment characterized by providing the following. A setting means to set up the amendment field which applies amendment on an effective screen. A judgment means judges [a means divide the amendment field into four rectangle fields, using the amendment central point of the above-mentioned amendment field as common, and / whether it is located to four above-mentioned blocks / which / of a rectangle field] in the pixel by which amendment processing is carried out and /, and specify the pixel position within the block with address data, and an amendment means carry out interpolation processing of each pixel in the above-mentioned amendment field by amendment amendment data and the above-mentioned address data in the above-mentioned amendment central point

[Claim 2] The above-mentioned amendment central point is image display equipment according to claim 1 characterized by being set up so that it may become the maximum amendment point on the above-mentioned effective screen.
[Claim 3] Image display equipment characterized by providing the following. A setting means to set up the 3-dimensional amendment field which applies amendment on an effective screen. A means to divide the amendment field into eight method object fields of merit, using the amendment central point of an amendment field 3-dimensional [above-mentioned] as common, A judgment means to judge whether the pixel by which amendment processing is carried out is located in eight above-mentioned blocks [which / of the method object field of merit], and to pinpoint the pixel position within the block by 3-dimensional address data, An amendment means by which amendment amendment data and address data 3-dimensional [above-mentioned] perform interpolation processing of each pixel in the above-mentioned amendment field for the above-mentioned amendment central point.
[Claim 4] The above-mentioned amendment central point is image display equipment according to claim 3 characterized by being set up so that it may become the maximum amendment point on the above-mentioned effective screen.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] With respect to image display equipment, in image display, such as a display and a projector, in case especially this invention performs nonlinear processing, such as alignment processing of white balance adjustment etc., or a gamma correction, it relates to suitable image display equipment.
[0002]
[Description of the Prior Art] The block diagram of the signal system of RGB3 board type liquid crystal BUROJIEKUTA carried in drawing 8 as a conventional example at a projected type television receiver etc. is shown. In this drawing 8 , the video signals R, G, and B which contrast and brightness were adjusted in the user control section 20, and suited the liking of a user of the in three primary colors video signals R, G, and B inputted from the preceding paragraph block which is not illustrated are formed. While adjustment of color temperature is performed by the white balance controller 30 by which these video signals R, G, and B are constituted from gain circuits 31R, 31G, and 31B where suitable gain is given, and bias circuits 32R, 32G, and 32B to which suitable bias is given, gamma amendment is given in the gamma correction section 40 constituted with the nonlinear amplifier 41R, 41G, and 41B, and quality of image is adjusted. And each chrominance-signal component is supplied to each LCD panels 70R, 70G, and 70B of the liquid crystal board 70 through the LCD drivers 60R, 60G, and 60B prepared in the liquid crystal display (liquid crystal display) driver section 60.
[0003] It is made for a timing generator 80 to generate the timing signal of the liquid crystal drivers 60R, 60G, and 60B in the PLL (Phase Locked Loop) circuit 81 based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted.
[0004] Thus, in a projected type television receiver, R, G, and B light will be irradiated by each LCD panels 70R, 70G, and 70B of the liquid crystal board 70, respectively, and the transmitted light will be projected on a screen etc.
[0005] However, a circuit block of the signal system of a liquid crystal projector which was described above The adjustment value with the correction value same on the whole screen for performing gamma amendment in the adjustment value and the gamma correction section 40 for adjusting color temperature by the white balance controller 30, since all signals shall be processed in analog, Since it is made to process using correction value, there is no effect of improving ****** of the so-called uniformity called the brightness and chromaticity nonuniformity which originate in the manufacture variation and the projection lamp of the LCD panels 70R, 70G, and 70B which are formed in the liquid crystal board 70, and are generated.
[0006] Then, the circuit block of the signal system of RGB board type liquid crystal BUROJIEKUTA which can improve ****** of uniformity which was described above is proposed, and the block diagram is shown in drawing 9 . Moreover, the input voltage V of the common LCD (liquid crystal display) panel to drawing 11 and the relation of permeability T are shown.
[0007] In this drawing 9 , the analog video signals R, G, and B of each color inputted from the preceding

paragraph block which is not illustrated are changed into a digital image signal, respectively by each A/D converters 10R, 10G, and 10B of the A/D-conversion section 10, and the picture signal which contrast and brightness were adjusted in the user control section 20 like above-mentioned drawing 8 , and suited liking of a user is formed. And while adjustment of color temperature is performed by the digital signal, data are read from the look-up tables 42R, 42G, and 42B with the data of a property curve contrary to a V-T property as shown in drawing 11 , and it is made to apply gamma amendment in the gamma correction section 40 by the white balance controller 30.
[0008] The amendment data calculated in the two-dimensional interpolation section 100 which showed the amendment data for performing adjustment and amendment in the above-mentioned white balance controller 30 or the gamma correction section 40 with the dashed line are used. It is constituted by the position block-address storage section 101, correction value storage section 102, and 103 or 4 position block specification processing sections correction value extraction section 104, the coordinate specification section 105 within a position block, and the two-dimensional interpolation processing section 106 at this two-dimensional interpolation section 100. While making horizontal the effective screen 72 except the blanking section 71 of the display screen 70 as shown in drawing 10 m division, when n division of is done perpendicularly, the coordinate address of the intersection (m+1) * (n+1) individual is beforehand memorized by the position block-address storage section 101. Moreover, the correction value in the intersection of this (m+1) * (n+1) individual is memorized by the correction value storage section 102.
[0009] Thus, while the two-dimensional interpolation section 100 makes the position block-address storage section 101 memorize the coordinate address of an intersection (m+1) * (n+1) individual, it is making the correction value storage section 102 memorize the correction value in the intersection of (m+1) * (n+1) individual, and it is made to calculate the correction value in arbitrary pixels. That is, when calculating the correction value in the pixel G (X, Y) shown, for example in drawing 10 , first, it specifies in which position block this pixel G is contained in the position block specification processing section 103, and the correction value of four points contained in the specified block is called to the four point correction-value extraction section 104 from the correction value storage section 102.
[0010] The coordinate specification section 105 within a position block will calculate the interpolation data which have distinguished whether in which place of the position block the pixel G (X and Y) as which the position block was specified in the position block specification processing section 103 exists, and interpolate it two-dimensional based on four correction value called to the distinction result of the coordinate specification section 105 within a position block, and the four point correction-value extraction section 105 in the two-dimensional interpolation processing section 106.
[0011] The interpolation data obtained in the two-dimensional interpolation section 100 by thus, the thing to use as a parameter of the white balance controller 30 or the gamma correction section 40 the inside of the effective screen 72 of the display screen 70 -- setting -- the position of Pixel G -- responding -- brightness and chromaticity nonuniformity -- an amendment -- since things are made, there is an advantage that improvement in quality of image can be aimed at as compared with the circuit block of the signal system of RGB3 board type liquid crystal BUROJIEKUTA as shown in above-mentioned drawing 8
[0012]
[Problem(s) to be Solved by the Invention] However, it sets to the signal system circuit block of a liquid crystal projector as shown in above-mentioned drawing 9 . By setting up a grid-like block in the effective screen 72 beforehand, and making the correction value storage section 102 memorize the correction value of the intersection. If the place which the nonuniformity of brightness or a chromaticity produces does not exist in the intersection (peak) which divided this screen in order to amend nonuniformity of brightness or a chromaticity, the effect of an improvement will decrease greatly. For this reason, the amendment's was difficult in brightness or chromaticity nonuniformity in the arbitrary positions in the effective screen 72.
[0013] Moreover, since there was the need of making [many] the number of screen separation of effective screen 70a shown in drawing 10 in order to raise the flexibility of adjustment, for example and

only the number of partitions needed to input correction value in this case, the memory of a comparatively big capacity was needed and there was also a fault that a circuit scale became large.
[0014]
[Means for Solving the Problem] A setting means to set up the amendment field which this invention is made in view of such a trouble, and applies amendment on an effective screen, A means to divide the amendment field into four rectangle fields, using the amendment central point of an amendment field as common, A judgment means to judge whether the pixel by which amendment processing is carried out is located in four blocks [which / of a rectangle field], and to pinpoint the pixel position within the block by address data, It has an amendment means by which amendment amendment data and address data perform interpolation processing of each pixel in an amendment field for the amendment central point.
[0015] Moreover, a setting means to set up the 3-dimensional amendment field which applies amendment on an effective screen, A means to divide the amendment field into eight method object fields of merit, using the amendment central point of a 3-dimensional amendment field as common, A judgment means to judge whether the pixel by which amendment processing is carried out is located in eight blocks [which / of the method object field of merit], and to pinpoint the pixel position within the block by 3-dimensional address data, It is made business equipped with an amendment means by which amendment amendment data and 3-dimensional address data perform interpolation processing of each pixel in the above-mentioned amendment field for the amendment central point.
[0016] Moreover, the above-mentioned aforementioned amendment central point was set up so that it might become the maximum amendment point on an effective screen.
[0017] While setting up arbitrarily the coordinate of the amendment central point of the amendment field to which amendment is applied according to this invention, the amendment field is divided into four rectangle fields, using the amendment central point as common. and the brightness and the chromaticity nonuniformity the interpolation data which perform [central point / amendment / above-mentioned] in interpolation processing of the arbitrary pixel positions in an amendment field by amendment amendment data and the above-mentioned address data are generated in an effective screen by asking while judge whether the pixel by which amendment processing is carried out with a judgment means is located in four above-mentioned blocks / which / of a rectangle field] and pinpointing the pixel position within the block by address data -- easy composition -- an amendment -- things can do
[0018]
[Embodiments of the Invention] Drawing 1 shows the block diagram of the signal system of RGB3 board type liquid crystal BUROJIEKUTA carried in a projected type television receiver etc. as a gestalt of operation of this invention. In this drawing 1, A/D converters 10R, 10G, and 10B for the A/D-conversion section 10 changing into the digital video signals R, G, and B each video signals R, G, and B of the analog of each color inputted from the preceding paragraph block which is not illustrated are formed. The contrast and the brightness of a display image are adjusted and it is made for the user control section 20 to have a user's favorite picture signal formed of the control signal supplied from the control circuit which is not illustrated, for example.
[0019] It is made for the white balance controller 30 to have the color temperature of the video signals R, G, and B from the user control section 20 adjusted. The gain circuits 31R, 31G, and 31B where suitable gain data are given in order to adjust the color temperature by the side of the white of each video signals R, G, and B, In order to adjust the color temperature by the side of the black of each video signals R, G, and B, the bias circuits 32R, 32G, and 32B to which suitable bias data are given are formed. The gamma correction section 40 gives a gamma correction to video signals R, G, and B from the white balance controller 30, and is adjusting quality of image, and the look-up tables 42R, 42G, and 42B for performing a gamma correction to each video signals R and G and every B are formed in the gamma correction section 40.
[0020] D/A converters 50R, 50G, and 50B for the D/A-conversion section 50 changing each digital video signals R, G, and B of the gamma correction section 40 into each video signals R, G, and B of an analog are formed. The liquid crystal driver 60 is the liquid crystal (LCD) driver 60 which drives the

liquid crystal board 70 by each chrominance-signal components R, G, and B from the D/A-conversion section 50, and the LCD panels 70R, 70G, and 70B of each color are formed in the liquid crystal board 70.

[0021] It is made for a timing generator 80 to generate the timing signal for driving the liquid crystal driver 60 by the PLL (Phase Locked Loop) circuit 81 based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted.

[0022] The two-dimensional interpolation section 1 calculates the two-dimensional interpolation data C (X, Y) in the arbitrary pixels G (X, Y) based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted so that it may mention later, and the two-dimensional interpolation data C (X, Y) is made to be supplied to it to the look-up table 42 of the gain circuit 31 of the above-mentioned white balance controller 30, a bias circuit 32, and the gamma correction section 40. Moreover, the center position coordinate data for which amendment of brightness or chromaticity nonuniformity is needed beforehand, the coordinate data of the amendment range, the amendment data in an amendment center position coordinate, etc. are supplied to the two-dimensional interpolation section 1, and it is stored in memory etc.

[0023] Drawing 2 is the block diagram having shown the example of 1 composition of the two-dimensional interpolation section 1 shown in above-mentioned drawing 1 . In this drawing 2 level / vertical-synchronization counter 2 When the position within the display screen of the pixel (signal) which performs amendment processing, i.e., the display screen, is seen as a flat surface The horizontal position coordinate X which is a counter for specifying the field coordinate (X, Y) of a pixel, and is outputted from this level / vertical-synchronization counter 2 While a zero reset is carried out synchronizing with horizontal synchronizing signal H.SYNC, it counts up for every clock CLK and considers as the coordinate data showing the position of a horizontal pixel. Moreover, synchronizing with vertical-synchronizing-signal V.SYNC, the zero reset of the vertical-position-coordinate Y outputted from level / vertical-synchronization counter 2 is carried out, and let it be the coordinate data showing the position of the pixel of the perpendicularly it counts up for every horizontal synchronizing signal H.SYNC. In addition, Clock CLK is what synchronized with the change on the time-axis of a pixel, and, generally is called dot clock.

[0024] The register for storing the amendment center coordinate data and the amendment range coordinate data which are mentioned later etc. is formed, in the time of works adjustment etc., beforehand, from the exterior, amendment center coordinate data and amendment range coordinate data are inputted into this register, and the coordinate data storing section 3 is stored in it.

[0025] An example of the display screen of the liquid crystal projector made into the gestalt of this operation here at drawing 3 is shown, and the amendment center coordinate data and the amendment range coordinate data which are stored in the above-mentioned data storage section 3 using this drawing are explained. In addition, in the example of the display screen shown in this drawing 3 , it considers as the thing of a screen which brightness nonuniformity or chromaticity nonuniformity has produced near the center mostly. Moreover, let the direction to which a pixel moves with the passage of time be the right direction supposing the X-Y plane coordinates which the display screen 70 set the X-axis as the horizontal direction of the effective screen 72 except the blanking section 71, and set the Y-axis as the perpendicular direction. correction

[0026] The amendment center coordinate data stored in the coordinate data storing section 3. It considers as the coordinate data Gc (Xc, Yc) of the central point to which the amendment shown in drawing 3 is applied. Amendment range coordinate data is set to the coordinate data G1 (X1, Y1) and G2 (X2, Y1) of the four vertices, G3 (X1, Y2), and G4 (X2, Y2) when the amendment field H for which the amendment shown in drawing 3 is needed is specified in a rectangle.

[0027] However, what is necessary is not to input the amendment range coordinate data G1 and G2, G3, and the coordinate data of all four points of G4 into the coordinate data storing section 3, and just to input four parameters X1, X2, Y1, and Y2 of the above-mentioned amendment range coordinate data into it. However, Parameters X1, X2, and Xc, and Y1, Y2 and Yc need to fulfill the conditions of X1 <=Xc<=X2 and Y1 <=Yc<=Y2.

[0028] In addition, it is carried out in the adjustment stage at the time of manufacture, and gets down, for example, an image is caught with camera equipment, it becomes possible to perform the automatic regulation by manufacture and the adjusting device, since it is realizable by analyzing brightness, and the place and grade of chromaticity nonuniformity, and coordinate data which was described above can also raise productive efficiency. Moreover, according to a facility, you may distinguish by human being's eyes.

[0029] Moreover, a setup of the coordinate data of the amendment central point Gc or the peaks G1-G4 is realizable by transmitting data to the microcomputer equipment in a set with the remote commander of the television receiver concerned, or an external computer apparatus.

[0030] While the coordinates X and Y of Pixel G (X, Y) are supplied from horizontal/vertical counter 2, as for the position block specification processing section 4, the parameters Xc and Yc of the amendment center coordinate Gc and the amendment range coordinates G1 and G2, G3, and the parameters X1, X2, Y1, and Y2 of G4 are supplied from the coordinate data storing section 3. And it is made to divide the amendment field H made into a rectangle into the position blocks A1, A2, A3, and A4 made into four more rectangle fields based on the amendment center coordinates Xc and Yc and the amendment range coordinates X1, X2, X3, and X4 which are supplied from the coordinate data storing section 3.

[0031] In the example shown in drawing 3 , while defining each position block A1, A2, A3, and A4 as four rectangles which make a vertical angle the peak Gn (1<=n<=4) and the amendment central point Gc of the amendment field H, the field which is in the effective screen 72 of the display screen 70, and does not belong to the above-mentioned position blocks A1-A4 is defined as A0.

[0032] Thus, when the outputs X and Y from horizontal/vertical counter 2 are given after dividing the inside of the effective screen 72 of the display screen 70 into five position blocks An (0<=n<=4 and n are an integer), it is made to specify in which block it is contained among the position blocks An with which this pixel G (X, Y) was developed by the X-Y side of effective screen 70a shown in drawing 3 .

[0033] The outputs X and Y which show the coordinate of the pixel G (X, Y) outputted, for example from horizontal/vertical counter 2 as specific processing here When block A4X and Y are except the above at the time of block A3 Xc<X<=X2 and Yc<Y<=Y2 at the time of block A2X1 <=X<=Xc and Yc<Y<=Y2 at the time of block A1 Xc<=X<=X2 and Y1 <=Y<=Yc at the time of X1 <=X<=Xc and Y1 <=Y<=Yc, It distinguishes from block A0 and is made to specify a position block.

[0034] The outputs X and Y which show the coordinate of the pixel G (X, Y) to which the position data-processing section 5 is outputted from horizontal/vertical counter 2, The parameters Xc and Yc of the amendment center coordinate Gc supplied from the coordinate data storing section 3 and the amendment range coordinates G1 and G2, G3, the parameters X1, X2, Y1, and Y2 of G4, and the position block An in the amendment field H supplied from the position block specification processing section 4 The suffix n to specify is supplied and it is. And the pixel G (X, Y) processed from these distinguishes in the address of what of the position block An of the amendment field H pinpointed in the above-mentioned position block specification processing section 4 it is located, and it is made to output the distinction result as address data Xb and Yb.

[0035] Here, the distinction method of the address data Xb and Yb in the position data-processing section 5 is explained, referring to drawing 4 . The address data Xb in case the pixel G (X, Y) processed as shown in drawing 4 is located in the position block A1 (suffix n= 1) It is shown by the distance of the direction of X of the amendment central point Gc and the peak G1, and the distance of the direction of X of Pixel G and the peak G1, and the distance of the direction of Y of the amendment central point Gc and the peak G1 and the distance of the direction of Y of Pixel G and the peak G1 can show the address data Yb.

[0036] Moreover, the address data Xb in case the pixel G (X, Y) to process is located in the position block A2 (n= 2) It is shown by the distance of the direction of X of the amendment central point Gc and the peak G2, and the distance of the direction of X of Pixel G and the peak G2, and the address data Yb are shown by the distance of the direction of Y of the amendment central point Gc and the peak G2, and the distance of the direction of Y of Pixel G and the peak G2.

[0037] The address data Xb in case Pixel G is similarly located in the position block A3 (n= 3) are

expressed by the distance of the direction of X of Pixel G and peak G3 to the distance of the direction of X of the amendment central point Gc and peak G3, and the address data Yb are shown by the distance of the direction of Y of Pixel G and peak G3 to the distance of the direction of Y of the amendment central point Gc and peak G3.

[0038] Similarly the address data Xb in case Pixel G (X, Y) is located in the position block A4 (n= 4) It is shown by the distance of the direction of X of the amendment central point Gc and the peak G4, and the distance of the direction of X of Pixel G and the peak G2, and the address data Yb are shown by the distance of the direction of Y of the amendment central point Gc and the peak G4, and the distance of the direction of Y of Pixel G and the peak G2.

[0039] Namely, the address data Xb and Yb are at the time of n= 0. At the time of Xb=Yb=0n=1 $Xb=(X-X1)/(Xc-X1)$, $Yb=(Y-Y1)/(Yc-Y1)$

At the time of n= 2 $Xb=(X2-X)/(X2-Xc)$, $Yb=(Y-Y1)/(Yc-Y1)$

At the time of n= 3 $Xb=(X-X1)/(Xc-X1)$, $Yb=(Y2-Y)/(Y2-Yc)$

At the time of n= 4 $Xb=(X2-X)/(X2-Xc)$, $Yb=(Y2-Y)/(Y2-Yc)$

A definition is given.

[0040] The register for storing the amendment data Cc in the amendment center coordinate Gc etc. is formed, in the time of works adjustment etc., beforehand, from the exterior, the amendment data Cc are inputted into this register, and the amendment data storage section 6 is stored in it.

[0041] It is made for the two-dimensional interpolation processing section 7 to ask for the two-dimensional interpolation data C (X, Y) of the pixel G in the arbitrary positions in X-Y plane coordinates (X, Y) based on the address data Xb and Yb from the position data-processing section 5, and the amendment data Cc from the amendment data storage section 6. For example, it can ask for the two-dimensional interpolation data C (X, Y) of Pixel G (X, Y) called for by linear interpolation with $C(X, Y) = Cc*Xb*Yb$.

[0042] In addition, the composition of the two-dimensional interpolation section 1 shown in drawing 2 is for calculating the two-dimensional interpolation data C of any one kind of video signal of video signals R, G, and B (X, Y), and three composition of the two-dimensional interpolation section 1 which showed the video signals R, G, and B of three colors to above-mentioned drawing 2 when asking for interpolation data is needed.

[0043] thus, the brightness and chromaticity nonuniformity which exist locally in the effective screen 72 by using the correction function C (X, Y) which has the position coordinate (X, Y) of the arbitrary pixels G obtained in the two-dimensional interpolation section 1 in a variable in the gestalt of this operation -- an amendment -- it is made like That is, in the gestalt of this operation, while inputting the coordinate data G1 and G2 of the amendment field where the coordinate data Gc of the central point and amendment to which amendment is applied will reach in the time of works adjustment etc., G3, and G4 since it is necessary to know the field on the screen which needs to perform interpolation processing in the two-dimensional interpolation section 1 beforehand for example, the amendment data Cc of the amendment central point are inputted. calculating the two-dimensional correction value Cc in the coordinate position G (X, Y) according to an operation, when the horizontal position coordinate X of the arbitrary pixels G and the vertical-position coordinate Y are given within the limits of effective screen 70a by this -- brightness, chromaticity nonuniformity, etc. -- an amendment -- it is made like

[0044] the gain circuit section 31 of the white balance controller 30 which showed the coordinate position (X, Y) of the arbitrary pixels G obtained in the above-mentioned two-dimensional interpolation section 1 to drawing 1 here using the correction function C (X, Y) which it has in a variable -- an amendment -- things are considered For the gain circuit section 31, since it considers as the circuit section which adjusts the color temperature by the side of the white of the picture which changes the amplification degree of each video signal of RGB, and is displayed, when level of the video signal generally inputted into this gain circuit section 31 is set to Z, the output signal D outputted from the gain circuit section 31 is $D(Z) = kZ$. (however, k is taken as gain data)

It is expressed and an output signal D serves as a function of Z.

[0045] When the correction function C (X, Y) obtained in the above-mentioned two-dimensional

interpolation section 1 is applied here, the output signal D outputted from the gain circuit section 31 is D (X, Y, Z) =(k+pC (X, Y)) Z. (however, p is taken as a constant)
A next door and Output D serve as signal level Z and a function of the position in effective screen 70a (X, Y). That is, in the gain circuit section 31 of the white balance controller 30, with a position, amplification degree can be changed now and the color temperature by the side of white can be locally changed now.
[0046] When an amendment case is considered, similarly the bias circuit section 32 of the white balance controller 30 in drawing 1 the bias circuit section 32 Since it considers as the circuit section which changes the dc component of each video signal of RGB, and adjusts the color temperature by the side of the black of the picture displayed, when level of the video signal inputted into the bias circuit section 32 is set to Z, an output signal B serves as a function of Z, and is B(Z) =Z+m. (however, m is taken as bias data)
It is shown.
[0047] When correction function C' (X, Y) obtained in the above-mentioned two-dimensional interpolation section 1 is applied here, it is B(X, Y, Z) =Z+m+qC' (X, Y). (however, q constant)
A next door and Output B serve as signal level Z and a function of the position in the effective screen 72 (X, Y). That is, in the bias circuit section 32, with a position, a direct-current (DC) component can be changed now and the color temperature by the side of black can be locally changed now.
[0048] Thus, the relation of the output signal W and input signal Z which are outputted from the white balance controller 30 is W(X, Y, Z) =(k+pC (X, Y)) Z+m+qC' (X, Y) by using two functions D and B obtained.
It can be shown.
[0049] Moreover, the correction function C (X, Y) obtained in the two-dimensional interpolation section 1 can be applied also to the gamma correction section 40 completely like application to the above-mentioned white balance controller 30. In addition, it is shown by the gamma correction section 40 as a property that it is an amendment thing, for example, the property of the input voltage V-permeability T of the LCD panel 70 shown in drawing 1 is shown in drawing 5 .
[0050] If level of the signal outputted from Z and the gamma correction section 40 in the level of the input signal inputted into the gamma correction section 40 here is set to gamma The output delta of the gamma correction section 40 at the time of applying the correction function C (X, Y) which gamma was shown by function [of Z] gamma (Z) and was obtained in the above-mentioned two-dimensional interpolation section 1, and C' (X, Y) is delta(X, Y, Z) =(1+pC (X, Y)) gamma(Z)+qC' (X, Y).
(However, p and q constant)
It will be shown.
[0051] That is, the gamma correction function delta turns into the input signal level Z and a function of the position in the effective screen 72 (X, Y), and with a position, a gamma correction can change and it can change now the V-T property of the LCD panel 70 locally.
[0052] In addition, although how to calculate the correction value C in all the pixel positions in a screen at the time of setting the amendment data of one point, an amendment center position, and one amendment range as X-Y plane coordinates in the form of this operation was shown This is an example to the last, and when two or more amendment data, amendment center positions, and amendment ranges are set up, it is completely possible similarly to calculate the correction value C in all the pixel positions in a screen. However, it is conditions that two or more amendment center positions and amendment ranges do not lap in the form of this operation.
[0053] In addition, if the amendment data of the portion which would perform maximum processing and will overlap if the amendment data of the portion which would perform average processing and will overlap if the amendment data of the duplicate portion are positive and negative are positive and positive when a center position coordinate and an amendment range coordinate overlap, for example are negative and negative, it is possible to realize by performing minimum value processing.
[0054] Next, the case where 3-dimensional interpolation is carried out to the circuit block of the signal system of a projector as shown in above-mentioned drawing 1 as a form of other operations of this

invention is explained. In addition, since the composition of the 3-dimensional interpolation section is realizable with the same composition as the two-dimensional interpolation section 1 shown in above-mentioned drawing 2 , suppose that the composition is omitted.
[0055] In order to ask for a 3-dimensional correction function in the 3-dimensional interpolation section, the X-Y-Z space coordinates which set the Z-axis as signal level are set up, and it asks for the 3-dimensional correction function C (X, Y, Z) in the coordinate in it (X, Y, Z). Hereafter, how to ask for the 3-dimensional correction function C (X, Y, Z) is explained, referring to drawing 6 .
[0056] In this case, it will be inputted and stored in the coordinate data storing section 3 of the 3-dimensional interpolation section, the coordinate data Gc (Xc, Yc, Zc) of the amendment central point, the parameters X1, X2, Y1, and Y2 of the amendment range coordinate of the effective screen 72, and the range Z1 and Z2 of the signal level which amendment attains to, i.e., ranges of a Z direction. Moreover, the amendment data Cc in the amendment central point Gc (Xc, Yc, Zc) will be inputted and stored in the amendment data storage section 6.
[0057] Thus, while parameters X1, X2, Y1, Y2, Z1, and Z2 are stored in the coordinate data storing section 3, where the amendment data Cc (Xc, Yc, Zc) are stored in the amendment data storage section 6, it can ask for 3-dimensional interpolation data like the method which asked for the above-mentioned two-dimensional interpolation data.
[0058] For example, the address data Xb of the direction of X, the address data Yb of the direction of Y, and the address data Zb of a Z direction can be defined as follows from arbitrary Pixels G (X, Y, Z) and peaks of the rectangular parallelepiped of X-Y-Z space coordinates which are processed as shown in drawing 6 , and the position of the pixel G (X, Y, Z) processed.
[0059] Time Xb=(X-X1)/[Z<=Zc / Z1 <=/ X1 <=X<=Xc, Y1 <=Y<=Yc, and] (Xc-X1), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X2-X)/[Z<=Zc / Z1 <=/ Xc<X<=X2, Y1 <=Y<=Yc, and] (X2-Xc), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X-X1)/[Z<=Zc / Z1 <=/ X1 <=X<=Xc, Yc<Y<=Y2, and] (Xc-X1), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X2-X)/[Z<=Zc / Z1 <=/ Xc<X<=X2, Yc<Y<=Y2, and] (X2-Xc), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X-X1)/[Zc<Z<=Z / X1 <=X<=Xc, Y1 <=Y<=Yc, and /2] (Xc-X1), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X2-X)/[Zc<Z<=Z / Xc<X<=X2, Y1 <=Y<=Yc, and /2] (X2-Xc), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X-X1)/[Zc<Z<=Z / X1 <=X<=Xc, Yc<Y<=Y2, and /2] (xc-X1), Yb=(Y2-Y)/(Y2-Yc) .Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X2-X)/[Zc<Z<=Z / Xc<X<=X2, Yc<Y<=Y2, and /2] (X2-Xc), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z2-Z)/(Z2-Zc)
When X, Y, and Z are except the above Xb=Yb=Zb=0[0060] The address data Xb, Yb, and Zb in the pixel G (X, Y, Z) calculated in the position data-processing section 5 as mentioned above are supplied to the 3-dimensional interpolation processing section 7, and it sets in the 3-dimensional interpolation processing section 7. It is made to ask for the 3-dimensional interpolation data C (X, Y, Z) of the arbitrary pixels G (X, Y, Z) based on these address data Xb, Yb, and Zb and the amendment data Cc from the amendment data storage section 6.
[0061] For example, C(X, Y, Z) =Cc*Xb*Yb*Zb can show the 3-dimensional interpolation data C (X, Y, Z) in the arbitrary pixels G (X, Y, Z) called for by linear interpolation.
[0062] thus, amendment according to a coordinate position by using the correction function C (X, Y, Z) which has the position coordinate (X, Y, Z) of a certain pixel G obtained in the 3-dimensional interpolation section in a variable in the gestalt of other operations of this invention -- in addition, amendment by signal level is attained and nonlinear processing with still higher adjustment flexibility can be performed
[0063] the gamma correction section 40 which showed the position (X, Y, Z) obtained in the 3-

dimensional interpolation section to drawing 1 here using the correction function C (X, Y, Z) which it has in a variable -- an amendment -- when things are considered, the output gamma of the gamma correction section 40 is expressed with function [of an input signal Z] gamma (Z) Therefore, when the output of the gamma correction section 40 at the time of applying the 3-dimensional correction function C (X, Y, Z) obtained in the 3-dimensional interpolation section which was described above is set to delta, the output delta of the gamma correction section 40 is delta(X, Y, Z) =gamma(Z)+pC (X, Y, Z). (however, p constant)
It can be shown by carrying out.
[0064] That is, when performing 3-dimensional interpolation, it could be said that the gamma correction function delta performed the gamma correction which changes with the positions and signal level of Pixel G as it not only can apply amendment by the position coordinate (X, Y), but becomes possible to apply amendment only by signal level Z (20IRE-50IRE), for example, is shown in drawing 7 .
[0065] In addition, in the form of this operation, although the case where it applied to the signal system of the liquid crystal projector in which the two-dimensional interpolation section 1 or the 3-dimensional interpolation section is carried by the projected type television receiver was explained, it is possible to apply, for example to various image display equipments, such as CRT (Cathode Ray Tube), PDP (Plasma Display Panel), and PALC (Plasma Addressed LiquidCrystal), without being limited to this.
[0066]
[Effect of the Invention] as mentioned above, the heterogeneity of the quantity of light distribution from the light source which carries out incidence to the heterogeneity and the display device by the position and signal level in the display area of the properties (a transparency property, a reflection property, luminescence property, etc.) over an input signal according to this invention as explained -- an amendment -- things come be made
[0067] Moreover, since what is necessary is for there to be no need of having the correction value for every pixel, and just to set up dispersedly, it can realize on a scale of a small circuit, and can consider as the high thing of practicality. Since an amendment center position and the amendment range can set up freely, while being able to amend brightness and chromaticity nonuniformity in the arbitrary positions on a screen, there is also an advantage that amendment of the nonuniformity whose amendment data are not a concentric circle-like for at least one is attained further again.

[Translation done.]

TECHNICAL FIELD

[The technical field to which invention belongs] With respect to image display equipment, in image display, such as a display and a projector, in case especially this invention performs nonlinear processing, such as alignment processing of white balance adjustment etc., or a gamma correction, it relates to suitable image display equipment.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] The block diagram of the signal system of RGB3 board type liquid crystal BUROJIEKUTA carried in drawing 8 as a conventional example at a projected type television receiver etc. is shown. In this drawing 8 , the video signals R, G, and B which contrast and brightness were adjusted in the user control section 20, and suited the liking of a user of the in three primary colors video signals R, G, and B inputted from the preceding paragraph block which is not illustrated are formed. While adjustment of color temperature is performed by the white balance controller 30 by which these video signals R, G, and B are constituted from gain circuits 31R, 31G, and 31B where suitable gain is given, and bias circuits 32R, 32G, and 32B to which suitable bias is given, gamma amendment is given in the gamma correction section 40 constituted with the nonlinear amplifier 41R, 41G, and 41B, and quality of image is adjusted. And each chrominance-signal component is supplied to each LCD panels 70R, 70G, and 70B of the liquid crystal board 70 through the LCD drivers 60R, 60G, and 60B prepared in the liquid crystal display (liquid crystal display) driver section 60.
[0003] It is made for a timing generator 80 to generate the timing signal of the liquid crystal drivers 60R, 60G, and 60B in the PLL (Phase Locked Loop) circuit 81 based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted.
[0004] Thus, in a projected type television receiver, R, G, and B light will be irradiated by each LCD panels 70R, 70G, and 70B of the liquid crystal board 70, respectively, and the transmitted light will be projected on a screen etc.
[0005] However, a circuit block of the signal system of a liquid crystal projector which was described above The adjustment value with the correction value same on the whole screen for performing gamma amendment in the adjustment value and the gamma correction section 40 for adjusting color temperature by the white balance controller 30, since all signals shall be processed in analog, Since it is made to process using correction value, there is no effect of improving ****** of the so-called uniformity called the brightness and chromaticity nonuniformity which originate in the manufacture variation and the projection lamp of the LCD panels 70R, 70G, and 70B which are formed in the liquid crystal board 70, and are generated.
[0006] Then, the circuit block of the signal system of RGB board type liquid crystal BUROJIEKUTA which can improve ****** of uniformity which was described above is proposed, and the block diagram is shown in drawing 9 . Moreover, the input voltage V of the common LCD (liquid crystal display) panel to drawing 11 and the relation of permeability T are shown.
[0007] In this drawing 9 , the analog video signals R, G, and B of each color inputted from the preceding paragraph block which is not illustrated are changed into a digital image signal, respectively by each A/D converters 10R, 10G, and 10B of the A/D-conversion section 10, and the picture signal which contrast and brightness were adjusted in the user control section 20 like above-mentioned drawing 8 , and suited liking of a user is formed. And while adjustment of color temperature is performed by the digital signal, data are read from the look-up tables 42R, 42G, and 42B with the data of a property curve contrary to a V-T property as shown in drawing 11 , and it is made to apply gamma amendment in the gamma correction section 40 by the white balance controller 30.

[0008] The amendment data calculated in the two-dimensional interpolation section 100 which showed the amendment data for performing adjustment and amendment in the above-mentioned white balance controller 30 or the gamma correction section 40 with the dashed line are used. It is constituted by the position block-address storage section 101, correction value storage section 102, and 103 or 4 position block specification processing sections correction value extraction section 104, the coordinate specification section 105 within a position block, and the two-dimensional interpolation processing section 106 at this two-dimensional interpolation section 100. While making horizontal the effective screen 72 except the blanking section 71 of the display screen 70 as shown in drawing 10 m division, when n division of is done perpendicularly, the coordinate address of the intersection (m+1) * (n+1) individual is beforehand memorized by the position block-address storage section 101. Moreover, the correction value in the intersection of this (m+1) * (n+1) individual is memorized by the correction value storage section 102.
[0009] Thus, while the two-dimensional interpolation section 100 makes the position block-address storage section 101 memorize the coordinate address of an intersection (m+1) * (n+1) individual, it is making the correction value storage section 102 memorize the correction value in the intersection of (m+1) * (n+1) individual, and it is made to calculate the correction value in arbitrary pixels. That is, when calculating the correction value in the pixel G (X, Y) shown, for example in drawing 10 , first, it specifies in which position block this pixel G is contained in the position block specification processing section 103, and the correction value of four points contained in the specified block is called to the four-point correction value extraction section 104 from the correction value storage section 102.
[0010] The coordinate specification section 105 within a position block will calculate the interpolation data which have distinguished whether in which place of the position block the pixel G (X and Y) as which the position block was specified in the position block specification processing section 103 exists, and interpolate it two-dimensional based on four correction value called to the distinction result of the coordinate specification section 105 within a position block, and the four point correction-value extraction section 105 in the two-dimensional interpolation processing section 106.
[0011] The interpolation data obtained in the two-dimensional interpolation section 100 by thus, the thing to use as a parameter of the white balance controller 30 or the gamma correction section 40 the inside of the effective screen 72 of the display screen 70 -- setting -- the position of Pixel G -- responding -- brightness and chromaticity nonuniformity -- an amendment -- since things are made, there is an advantage that improvement in quality of image can be aimed at as compared with the circuit block of the signal system of RGB3 board type liquid crystal BUROJIEKUTA as shown in above-mentioned drawing 8

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] as mentioned above, the heterogeneity of the quantity of light distribution from the light source which carries out incidence to the heterogeneity and the display device by the position and signal level in the display area of the properties (a transparency property, a reflection property, luminescence property, etc.) over an input signal according to this invention as explained -- an amendment -- things come be made
[0067] Moreover, since what is necessary is for there to be no need of having the correction value for every pixel, and just to set up dispersedly, it can realize on a scale of a small circuit, and can consider as the high thing of practicality. Since an amendment center position and the amendment range can set up freely, while being able to amend brightness and chromaticity nonuniformity in the arbitrary positions on a screen, there is also an advantage that amendment of the nonuniformity whose amendment data are not a concentric circle-like for at least one is attained further again.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, it sets to the signal system circuit block of a liquid crystal projector as shown in above-mentioned drawing 9 . By setting up a grid-like block in the effective screen 72 beforehand, and making the correction value storage section 102 memorize the correction value of the intersection If the place which the nonuniformity of brightness or a chromaticity produces does not exist in the intersection (peak) which divided this screen in order to amend nonuniformity of brightness or a chromaticity, the effect of an improvement will decrease greatly. For this reason, the amendment's was difficult in brightness or chromaticity nonuniformity in the arbitrary positions in the effective screen 72.
[0013] Moreover, since there was the need of making [many] the number of screen separation of effective screen 70a shown in drawing 10 in order to raise the flexibility of adjustment, for example and only the number of partitions needed to input correction value in this case, the memory of a comparatively big capacity was needed and there was also a fault that a circuit scale became large.

[Translation done.]

MEANS

[Means for Solving the Problem] A setting means to set up the amendment field which this invention is made in view of such a trouble, and applies amendment on an effective screen, A means to divide the amendment field into four rectangle fields, using the amendment central point of an amendment field as common, A judgment means to judge whether the pixel by which amendment processing is carried out is located in four blocks [which / of a rectangle field], and to pinpoint the pixel position within the block by address data, It has an amendment means by which amendment amendment data and address data perform interpolation processing of each pixel in an amendment field for the amendment central point.
[0015] Moreover, a setting means to set up the 3-dimensional amendment field which applies amendment on an effective screen, A means to divide the amendment field into eight method object fields of merit, using the amendment central point of a 3-dimensional amendment field as common, A judgment means to judge whether the pixel by which amendment processing is carried out is located in eight blocks [which / of the method object field of merit], and to pinpoint the pixel position within the block by 3-dimensional address data, It is made business equipped with an amendment means by which amendment amendment data and 3-dimensional address data perform interpolation processing of each pixel in the above-mentioned amendment field for the amendment central point.
[0016] Moreover, the above-mentioned aforementioned amendment central point was set up so that it might become the maximum amendment point on an effective screen.
[0017] While setting up arbitrarily the coordinate of the amendment central point of the amendment field to which amendment is applied according to this invention, the amendment field is divided into four rectangle fields, using the amendment central point as common. and the brightness and the chromaticity nonuniformity the interpolation data which perform [central point / amendment / above-mentioned] in interpolation processing of the arbitrary pixel positions in an amendment field by amendment amendment data and the above-mentioned address data are generated in an effective screen by asking while judge whether the pixel by which amendment processing is carried out with a judgment means is located in four above-mentioned blocks / which / of a rectangle field] and pinpointing the pixel position within the block by address data -- easy composition -- an amendment -- things can do
[0018]
[Embodiments of the Invention] Drawing 1 shows the block diagram of the signal system of RGB3 board type liquid crystal BUROJIEKUTA carried in a projected type television receiver etc. as a form of operation of this invention. In this drawing 1 , A/D converters 10R, 10G, and 10B for the A/D-conversion section 10 changing into the digital video signals R, G, and B each video signals R, G, and B of the analog of each color inputted from the preceding paragraph block which is not illustrated are formed. The contrast and the brightness of a display image are adjusted and it is made for the user control section 20 to have a user's favorite picture signal formed of the control signal supplied from the control circuit which is not illustrated, for example.
[0019] It is made for the white balance controller 30 to have the color temperature of the video signals R, G, and B from the user control section 20 adjusted. The gain circuits 31R, 31G, and 31B where

suitable gain data are given in order to adjust the color temperature by the side of the white of each video signals R, G, and B, In order to adjust the color temperature by the side of the black of each video signals R, G, and B, the bias circuits 32R, 32G, and 32B to which suitable bias data are given are formed. The gamma correction section 40 gives a gamma correction to video signals R, G, and B from the white balance controller 30, and is adjusting quality of image, and the look-up tables 42R, 42G, and 42B for performing a gamma correction to each video signals R and G and every B are formed in the gamma correction section 40.

[0020] D/A converters 50R, 50G, and 50B for the D/A-conversion section 50 changing each digital video signals R, G, and B of the gamma correction section 40 into each video signals R, G, and B of an analog are formed. The liquid crystal driver 60 is the liquid crystal (LCD) driver 60 which drives the liquid crystal board 70 by each chrominance-signal components R, G, and B from the D/A-conversion section 50, and the LCD panels 70R, 70G, and 70B of each color are formed in the liquid crystal board 70.

[0021] It is made for a timing generator 80 to generate the timing signal for driving the liquid crystal driver 60 by the PLL (Phase Locked Loop) circuit 81 based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted.

[0022] The two-dimensional interpolation section 1 calculates the two-dimensional interpolation data C (X, Y) in the arbitrary pixels G (X, Y) based on horizontal synchronizing signal H.SYNC, vertical-synchronizing-signal V.SYNC, and Clock CLK which are inputted so that it may mention later, and the two-dimensional interpolation data C (X, Y) is made to be supplied to it to the look-up table 42 of the gain circuit 31 of the above-mentioned white balance controller 30, a bias circuit 32, and the gamma correction section 40. Moreover, the center position coordinate data for which amendment of brightness or chromaticity nonuniformity is needed beforehand, the coordinate data of the amendment range, the amendment data in an amendment center position coordinate, etc. are supplied to the two-dimensional interpolation section 1, and it is stored in memory etc.

[0023] Drawing 2 is the block diagram having shown the example of 1 composition of the two-dimensional interpolation section 1 shown in above-mentioned drawing 1 . In this drawing 2 level / vertical-synchronization counter 2 When the position within the display screen of the pixel (signal) which performs amendment processing, i.e., the display screen, is seen as a flat surface The horizontal position coordinate X which is a counter for specifying the field coordinate (X, Y) of a pixel, and is outputted from this level / vertical-synchronization counter 2 While a zero reset is carried out synchronizing with horizontal synchronizing signal H.SYNC, it counts up for every clock CLK and considers as the coordinate data showing the position of a horizontal pixel. Moreover, synchronizing with vertical-synchronizing-signal V.SYNC, the zero reset of the vertical-position coordinate Y outputted from level / vertical-synchronization counter 2 is carried out, and let it be the coordinate data showing the position of the pixel of the perpendicularly it counts up for every horizontal synchronizing signal H.SYNC. In addition, Clock CLK is what synchronized with the change on the time-axis of a pixel, and, generally is called dot clock.

[0024] The register for storing the amendment center coordinate data and the amendment range coordinate data which are mentioned later etc. is formed, in the time of works adjustment etc., beforehand, from the exterior, amendment center coordinate data and amendment range coordinate data are inputted into this register, and the coordinate data storing section 3 is stored in it.

[0025] An example of the display screen of the liquid crystal projector made into the form of this operation here at drawing 3 is shown, and the amendment center coordinate data and the amendment range coordinate data which are stored in the above-mentioned data storage section 3 using this drawing are explained. In addition, in the example of the display screen shown in this drawing 3 , it considers as the thing of a screen which brightness nonuniformity or chromaticity nonuniformity has produced near the center mostly. Moreover, let the direction to which a pixel moves with the passage of time be the right direction supposing the X-Y plane coordinates which the display screen 70 set the X-axis as the horizontal direction of the effective screen 72 except the blanking section 71, and set the Y-axis as the perpendicular direction.

[0026] The amendment center coordinate data stored in the coordinate data storing section 3 It considers as the coordinate data Gc (Xc, Yc) of the central point to which the amendment shown in drawing 3 is applied. Amendment range coordinate data is set to the coordinate data G1 (X1, Y1) and G2 (X2, Y1) of the four vertices, G3 (X1, Y2), and G4 (X2, Y2) when the amendment field H for which the amendment shown in drawing 3 is needed is specified in a rectangle.
[0027] However, what is necessary is not to input the amendment range coordinate data G1 and G2, G3, and the coordinate data of all four points of G4 into the coordinate data storing section 3, and just to input four parameters X1, X2, Y1, and Y2 of the above-mentioned amendment range coordinate data into it. However, Parameters X1, X2, and Xc, and Y1, Y2 and Yc need to fulfill the conditions of X1 <=Xc<=X2 and Y1 <=Yc<=Y2.
[0028] In addition, it is carried out in the adjustment stage at the time of manufacture, and gets down, for example, an image is caught with camera equipment, it becomes possible to perform the automatic regulation by manufacture and the adjusting device, since it is realizable by analyzing brightness, and the place and grade of chromaticity nonuniformity, and coordinate data which was described above can also raise productive efficiency. Moreover, according to a facility, you may distinguish by human being's eyes.
[0029] Moreover, a setup of the coordinate data of the amendment central point Gc or the peaks G1-G4 is realizable by transmitting data to the microcomputer equipment in a set with the remote commander of the television receiver concerned, or an external computer apparatus.
[0030] While the coordinates X and Y of Pixel G (X, Y) are supplied from horizontal/vertical counter 2, as for the position block specification processing section 4, the parameters Xc and Yc of the amendment center coordinate Gc and the amendment range coordinates G1 and G2, G3, and the parameters X1, X2, Y1, and Y2 of G4 are supplied from the coordinate data storing section 3. And it is made to divide the amendment field H made into a rectangle into the position blocks A1, A2, A3, and A4 made into four more rectangle fields based on the amendment center coordinates Xc and Yc and the amendment range coordinates X1, X2, X3, and X4 which are supplied from the coordinate data storing section 3.
[0031] In the example shown in drawing 3 , while defining each position block A1, A2, A3, and A4 as four rectangles which make a vertical angle the peak Gn (1<=n<=4) and the amendment central point Gc of the amendment field H, the field which is in the effective screen 72 of the display screen 70, and does not belong to the above-mentioned position blocks A1-A4 is defined as A0.
[0032] Thus, when the outputs X and Y from horizontal/vertical counter 2 are given after dividing the inside of the effective screen 72 of the display screen 70 into five position blocks An (0<=n<=4 and n are an integer), it is made to specify in which block it is contained among the position blocks An with which this pixel G (X, Y) was developed by the X-Y side of effective screen 70a shown in drawing 3 .
[0033] The outputs X and Y which show the coordinate of the pixel G (X, Y) outputted, for example from horizontal/vertical counter 2 as specific processing here When block A4X and Y are except the above at the time of block A3 Xc<X<=X2 and Yc<Y<=Y2 at the time of block A2X1 <=X<=Xc and Yc<Y<=Y2 at the time of block A1 Xc<=X<=X2 and Y1 <=Y<=Yc at the time of X1 <=X<=Xc and Y1 <=Y<=Yc, It distinguishes from block A0 and is made to specify a position block.
[0034] The outputs X and Y which show the coordinate of the pixel G (X, Y) to which the position data-processing section 5 is outputted from horizontal/vertical counter 2, The parameters Xc and Yc of the amendment center coordinate Gc supplied from the coordinate data storing section 3 and the amendment range coordinates G1 and G2, G3, the parameters X1, X2, Y1, and Y2 of G4, and the position block An in the amendment field H supplied from the position block specification processing section 4 The suffix n to specify is supplied and it is. And the pixel G (X, Y) processed from these distinguishes in the address of what of the position block An of the amendment field H pinpointed in the above-mentioned position block specification processing section 4 it is located, and it is made to output the distinction result as address data Xb and Yb.
[0035] Here, the distinction method of the address data Xb and Yb in the position data-processing section 5 is explained, referring to drawing 4 . The address data Xb in case the pixel G (X, Y) processed as shown in drawing 4 is located in the position block A1 (suffix n= 1) It is shown by the distance of the

direction of X of the amendment central point Gc and the peak G1, and the distance of the direction of X of Pixel G and the peak G1, and the distance of the direction of Y of the amendment central point Gc and the peak G1 and the distance of the direction of Y of Pixel G and the peak G1 can show the address data Yb.
[0036] Moreover, the address data Xb in case the pixel G (X, Y) to process is located in the position block A2 (n= 2) It is shown by the distance of the direction of X of the amendment central point Gc and the peak G2, and the distance of the direction of X of Pixel G and the peak G2, and the address data Yb are shown by the distance of the direction of Y of the amendment central point Gc and the peak G2, and the distance of the direction of Y of Pixel G and the peak G2.
[0037] The address data Xb in case Pixel G is similarly located in the position block A3 (n= 3) are expressed by the distance of the direction of X of Pixel G and peak G3 to the distance of the direction of X of the amendment central point Gc and peak G3, and the address data Yb are shown by the distance of the direction of Y of Pixel G and peak G3 to the distance of the direction of Y of the amendment central point Gc and peak G3.
[0038] Similarly the address data Xb in case Pixel G (X, Y) is located in the position block A4 (n= 4) It is shown by the distance of the direction of X of the amendment central point Gc and the peak G4, and the distance of the direction of X of Pixel G and the peak G2, and the address data Yb are shown by the distance of the direction of Y of the amendment central point Gc and the peak G4, and the distance of the direction of Y of Pixel G and the peak G2.
[0039] Namely, the address data Xb and Yb are at the time of n= 0. At the time of Xb=Yb=0n=1 Xb=(X-X1)/(Xc-X1), Yb=(Y-Y1)/(Yc-Y1)
At the time of n= 2 Xb=(X2-X)/(X2-Xc), Yb=(Y-Y1)/(Yc-Y1)
At the time of n= 3 Xb=(X-X1)/(Xc-X1), Yb=(Y2-Y)/(Y2-Yc)
At the time of n= 4 Xb=(X2-X)/(X2-Xc), Yb=(Y2-Y)/(Y2-Yc)
A definition is given.
[0040] The register for storing the amendment data Cc in the amendment center coordinate Gc etc. is formed, in the time of works adjustment etc., beforehand, from the exterior, the amendment data Cc are inputted into this register, and the amendment data storage section 6 is stored in it.
[0041] It is made for the two-dimensional interpolation processing section 7 to ask for the two-dimensional interpolation data C (X, Y) of the pixel G in the arbitrary positions in X-Y plane coordinates (X, Y) based on the address data Xb and Yb from the position data-processing section 5, and the amendment data Cc from the amendment data storage section 6. For example, it can ask for the two-dimensional interpolation data C (X, Y) of Pixel G (X, Y) called for by linear interpolation with C(X, Y) =Cc*Xb*Yb.
[0042] In addition, the composition of the two-dimensional interpolation section 1 shown in drawing 2 is for calculating the two-dimensional interpolation data C of any one kind of video signal of video signals R, G, and B (X, Y), and three composition of the two-dimensional interpolation section 1 which showed the video signals R, G, and B of three colors to above-mentioned drawing 2 when asking for interpolation data is needed.
[0043] thus, the brightness and chromaticity nonuniformity which exist locally in the effective screen 72 by using the correction function C (X, Y) which has the position coordinate (X, Y) of the arbitrary pixels G obtained in the two-dimensional interpolation section 1 in a variable in the form of this operation -- an amendment -- it is made like That is, in the form of this operation, while inputting the coordinate data G1 and G2 of the amendment field where the coordinate data Gc of the central point and amendment to which amendment is applied will reach in the time of works adjustment etc., G3, and G4 since it is necessary to know the field on the screen which needs to perform interpolation processing in the two-dimensional interpolation section 1 beforehand for example, the amendment data Cc of the amendment central point are inputted. calculating the two-dimensional correction value Cc in the coordinate position G (X, Y) according to an operation, when the horizontal position coordinate X of the arbitrary pixels G and the vertical-position coordinate Y are given within the limits of effective screen 70a by this -- brightness, chromaticity nonuniformity, etc. -- an amendment -- it is made like

[0044] the gain circuit section 31 of the white balance controller 30 which showed the coordinate position (X, Y) of the arbitrary pixels G obtained in the above-mentioned two-dimensional interpolation section 1 to drawing 1 here using the correction function C (X, Y) which it has in a variable -- an amendment -- things are considered For the gain circuit section 31, since it considers as the circuit section which adjusts the color temperature by the side of the white of the picture which changes the amplification degree of each video signal of RGB, and is displayed, when level of the video signal generally inputted into this gain circuit section 31 is set to Z, the output signal D outputted from the gain circuit section 31 is D(Z) =kZ. (however, k is taken as gain data)
It is expressed and an output signal D serves as a function of Z.
[0045] When the correction function C (X, Y) obtained in the above-mentioned two-dimensional interpolation section 1 is applied here, the output signal D outputted from the gain circuit section 31 is D (X, Y, Z) =(k+pC (X, Y)) Z. (however, p is taken as a constant)
A next door and Output D serve as signal level Z and a function of the position in effective screen 70a (X, Y). That is, in the gain circuit section 31 of the white balance controller 30, with a position, amplification degree can be changed now and the color temperature by the side of white can be locally changed now.
[0046] When an amendment case is considered, similarly the bias circuit section 32 of the white balance controller 30 in drawing 1 the bias circuit section 32 Since it considers as the circuit section which changes the dc component of each video signal of RGB, and adjusts the color temperature by the side of the black of the picture displayed, when level of the video signal inputted into the bias circuit section 32 is set to Z, an output signal B serves as a function of Z, and is B(Z) =Z+m. (however, m is taken as bias data)
It is shown.
[0047] When correction function C' (X, Y) obtained in the above-mentioned two-dimensional interpolation section 1 is applied here, it is B(X, Y, Z) =Z+m+qC' (X, Y). (however, q constant)
A next door and Output B serve as signal level Z and a function of the position in the effective screen 72 (X, Y). That is, in the bias circuit section 32, with a position, a direct-current (DC) component can be changed now and the color temperature by the side of black can be locally changed now.
[0048] Thus, the relation of the output signal W and input signal Z which are outputted from the white balance controller 30 is W(X, Y, Z) =(k+pC (X, Y)) Z+m+qC' (X, Y) by using two functions D and B obtained.
It can be shown.
[0049] Moreover, the correction function C (X, Y) obtained in the two-dimensional interpolation section 1 can be applied also to the gamma correction section 40 completely like application to the above-mentioned white balance controller 30. In addition, it is shown by the gamma correction section 40 as a property that it is an amendment thing, for example, the property of the input voltage V-permeability T of the LCD panel 70 shown in drawing 1 is shown in drawing 5 .
[0050] If level of the signal outputted from Z and the gamma correction section 40 in the level of the input signal inputted into the gamma correction section 40 here is set to gamma The output delta of the gamma correction section 40 at the time of applying the correction function C (X, Y) which gamma was shown by function [of Z] gamma (Z) and was obtained in the above-mentioned two-dimensional interpolation section 1, and C' (X, Y) is delta(X, Y, Z) =(1+pC (X, Y)) gamma(Z)+qC' (X, Y). (However, p and q constant)
It will be shown.
[0051] That is, the gamma correction function delta turns into the input signal level Z and a function of the position in the effective screen 72 (X, Y), and with a position, a gamma correction can change and it can change now the V-T property of the LCD panel 70 locally.
[0052] In addition, although how to calculate the correction value C in all the pixel positions in a screen at the time of setting the amendment data of one point, an amendment center position, and one amendment range as X-Y plane coordinates in the gestalt of this operation was shown This is an example to the last, and when two or more amendment data, amendment center positions, and

amendment ranges are set up, it is completely possible similarly to calculate the correction value C in all the pixel positions in a screen. However, it is conditions that two or more amendment center positions and amendment ranges do not lap in the gestalt of this operation.
[0053] In addition, if the amendment data of the portion which would perform maximum processing and will overlap if the amendment data of the portion which would perform average processing and will overlap if the amendment data of the duplicate portion are positive and negative are positive and positive when a center position coordinate and an amendment range coordinate overlap, for example are negative and negative, it is possible to realize by performing minimum value processing.
[0054] Next, the case where 3-dimensional interpolation is carried out to the circuit block of the signal system of a projector as shown in above-mentioned drawing 1 as a gestalt of other operations of this invention is explained. In addition, since the composition of the 3-dimensional interpolation section is realizable with the same composition as the two-dimensional interpolation section 1 shown in above-mentioned drawing 2 , suppose that the composition is omitted.
[0055] In order to ask for a 3-dimensional correction function in the 3-dimensional interpolation section, the X-Y-Z space coordinates which set the Z-axis as signal level are set up, and it asks for the 3-dimensional correction function C (X, Y, Z) in the coordinate in it (X, Y, Z). Hereafter, how to ask for the 3-dimensional correction function C (X, Y, Z) is explained, referring to drawing 6 .
[0056] In this case, it will be inputted and stored in the coordinate data storing section 3 of the 3-dimensional interpolation section, the coordinate data Gc (Xc, Yc, Zc) of the amendment central point, the parameters X1, X2, Y1, and Y2 of the amendment range coordinate of the effective screen 72, and the range Z1 and Z2 of the signal level which amendment attains to, i.e., ranges of a Z direction. Moreover, the amendment data Cc in the amendment central point Gc (Xc, Yc, Zc) will be inputted and stored in the amendment data storage section 6.
[0057] Thus, while parameters X1, X2, Y1, Y2, Z1, and Z2 are stored in the coordinate data storing section 3, where the amendment data Cc (Xc, Yc, Zc) are stored in the amendment data storage section 6, it can ask for 3-dimensional interpolation data like the method which asked for the above-mentioned two-dimensional interpolation data.
[0058] For example, the address data Xb of the direction of X, the address data Yb of the direction of Y, and the address data Zb of a Z direction can be defined as follows from arbitrary Pixels G (X, Y, Z) and peaks of the rectangular parallelepiped of X-Y-Z space coordinates which are processed as shown in drawing 6 , and the position of the pixel G (X, Y, Z) processed.
[0059] Time Xb=(X-X1)/[Z<=Zc / Z1 <=/ X1 <=X<=Xc, Y1 <=Y<=Yc, and] (Xc-X1), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X2-X)/[Z<=Zc / Z1 <=/ Xc<X<=X2, Y1 <=Y<=Yc, and] (X2-Xc), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X-X1)/[Z<=Zc / Z1 <=/ X1 <=X<=Xc, Yc<Y<=Y2, and] (Xc-X1), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X2-X)/[Z<=Zc / Z1 <=/ Xc<X<=X2, Yc<Y<=Y2, and] (X2-Xc), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z-Z1)/(Zc-Z1)
Time Xb=(X-X1)/[Zc<Z<=Z / X1 <=X<=Xc, Y1 <=Y<=Yc, and /2] (Xc-X1), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X2-X)/[Zc<Z<=Z / Xc<X<=X2, Y1 <=Y<=Yc, and /2] (X2-Xc), Yb=(Y-Y1)/(Yc-Y1), Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X-X1)/[Zc<Z<=Z / X1 <=X<=Xc, Yc<Y<=Y2, and /2] (xc-X1), Yb=(Y2-Y)/(Y2-Yc) .Zb=(Z2-Z)/(Z2-Zc)
Time Xb=(X2-X)/[Zc<Z<=Z / Xc<X<=X2, Yc<Y<=Y2, and /2] (X2-Xc), Yb=(Y2-Y)/(Y2-Yc), Zb=(Z2-Z)/(Z2-Zc)
When X, Y, and Z are except the above Xb=Yb=Zb=0[0060] The address data Xb, Yb, and Zb in the pixel G (X, Y, Z) calculated in the position data-processing section 5 as mentioned above are supplied to the 3-dimensional interpolation processing section 7, and it sets in the 3-dimensional interpolation processing section 7. It is made to ask for the 3-dimensional interpolation data C (X, Y, Z) of the

arbitrary pixels G (X, Y, Z) based on these address data Xb, Yb, and Zb and the amendment data Cc from the amendment data storage section 6.
[0061] For example, C(X, Y, Z) =Cc*Xb*Yb*Zb can show the 3-dimensional interpolation data C (X, Y, Z) in the arbitrary pixels G (X, Y, Z) called for by linear interpolation.
[0062] thus, amendment according to a coordinate position by using the correction function C (X, Y, Z) which has the position coordinate (X, Y, Z) of a certain pixel G obtained in the 3-dimensional interpolation section in a variable in the gestalt of other operations of this invention -- in addition, amendment by signal level is attained and nonlinear processing with still higher adjustment flexibility can be performed
[0063] the gamma correction section 40 which showed the position (X, Y, Z) obtained in the 3-dimensional interpolation section to drawing 1 here using the correction function C (X, Y, Z) which it has in a variable -- an amendment -- when things are considered, the output gamma of the gamma correction section 40 is expressed with function [of an input signal Z] gamma (Z) Therefore, when the output of the gamma correction section 40 at the time of applying the 3-dimensional correction function C (X, Y, Z) obtained in the 3-dimensional interpolation section which was described above is set to delta, the output delta of the gamma correction section 40 is delta(X, Y, Z) =gamma(Z)+pC (X, Y, Z). (however, p constant)
It can be shown by carrying out.
[0064] That is, when performing 3-dimensional interpolation, it could be said that the gamma correction function delta performed the gamma correction which changes with the positions and signal level of Pixel G as it not only can apply amendment by the position coordinate (X, Y), but becomes possible to apply amendment only by signal level Z (20IRE-50IRE), for example, is shown in drawing 7 .
[0065] In addition, in the gestalt of this operation, although the case where it applied to the signal system of the liquid crystal projector in which the two-dimensional interpolation section 1 or the 3-dimensional interpolation section is carried by the projected type television receiver was explained, it is possible to apply, for example to various image display equipments, such as CRT (Cathode Ray Tube), PDP (Plasma Display Panel), and PALC (Plasma Addressed LiquidCrystal), without being limited to this.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

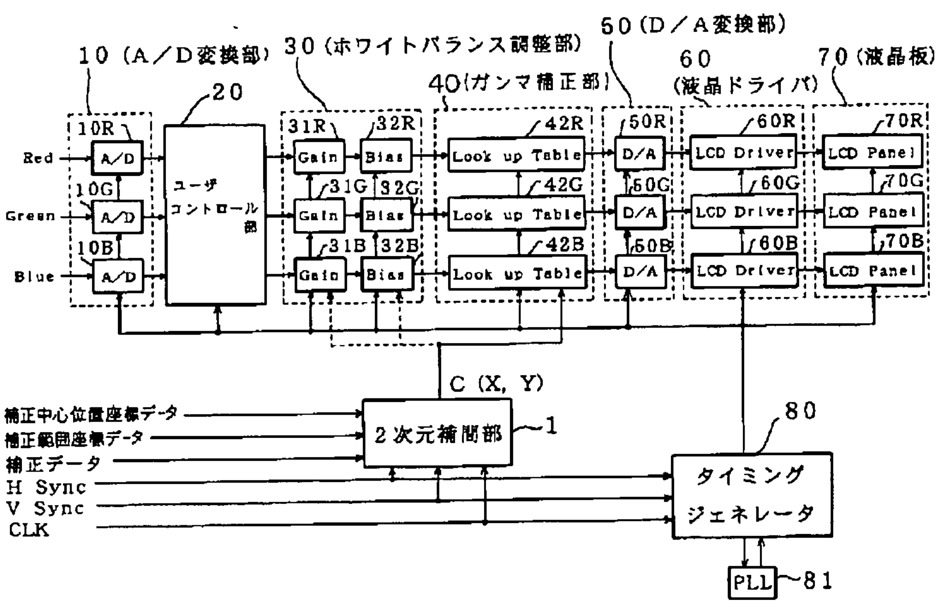
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the signal system of the liquid crystal projector made into the gestalt of operation of this invention.
[Drawing 2] It is the block diagram having shown one composition of the two-dimensional interpolation section shown in drawing 1 .
[Drawing 3] It is drawing having shown an example of the display screen of the liquid crystal projector made into the gestalt of this operation.
[Drawing 4] It is drawing having shown the example of a judgment of the address data Xb and Yb in the gestalt of this operation.
[Drawing 5] It is drawing having shown the relation of the input voltage V-permeability T of the LCD panel.
[Drawing 6] It is drawing having shown the example of a judgment of the address data Xb, Yb, and Zb in the gestalt of other operations of this invention.
[Drawing 7] It is drawing having shown the relation of the input voltage V-permeability T of the LCD panel.
[Drawing 8] It is the block diagram of the signal system of the conventional liquid crystal projector.
[Drawing 9] It is the block diagram of the signal system of the conventional liquid crystal projector.
[Drawing 10] It is drawing having shown an example of the display screen of the conventional liquid crystal projector.
[Drawing 11] It is drawing having shown the relation of the input voltage V-permeability T of the conventional LCD panel.
[Description of Notations]
1 Two-dimensional Amendment Section, 2 Horizontal/Vertical Counter, 3 Coordinate Data Storing Section, 4 Position Block Specification Processing Section, 5 Position Data-Processing Section, 6 Amendment Data Storage Section, 7 Two-dimensional Interpolation Processing Section, 10 A/D-Conversion Section, 20 User Control Section, 30 White Balance Sections, 40 Gamma Correction Section, 50 D/A-Conversion Section, 60 Liquid Crystal Driver, 70 Liquid Crystal Board

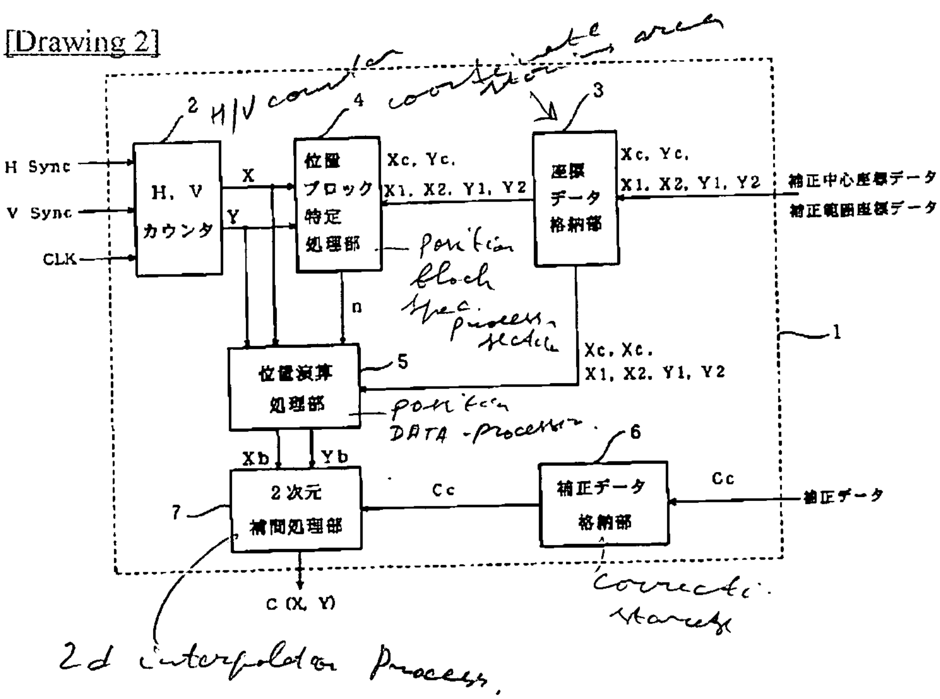
[Translation done.]

DRAWINGS

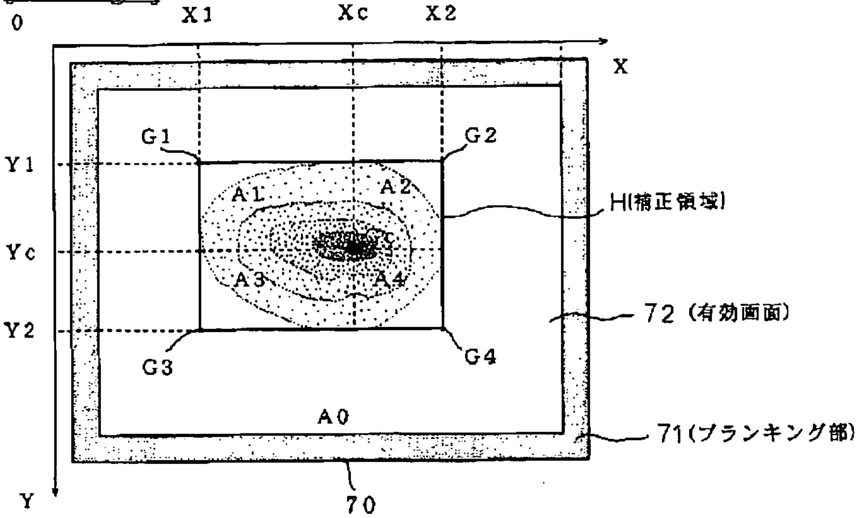
[Drawing 1]



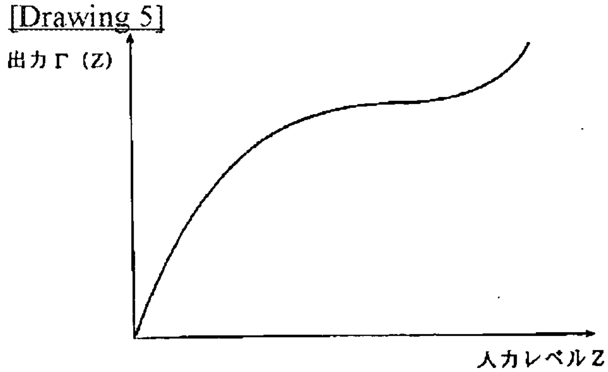
[Drawing 2]



[Drawing 3]

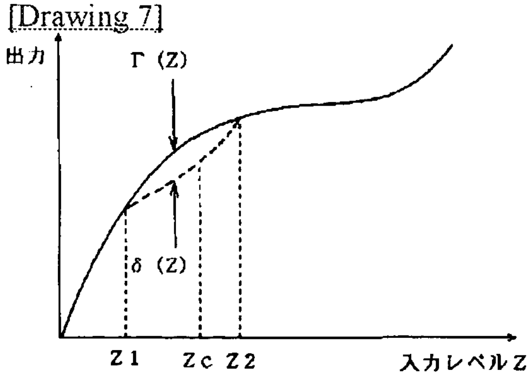


[Drawing 5]



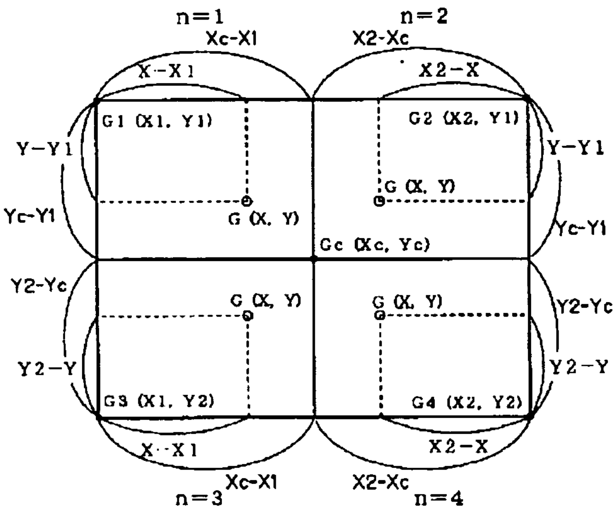
γ補正関数 Γ (Z)

[Drawing 7]

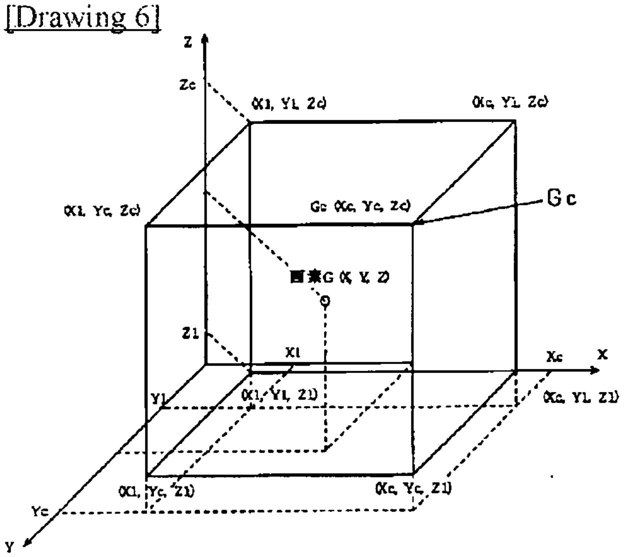


γ補正関数δ (X, Y, Z)

[Drawing 4]

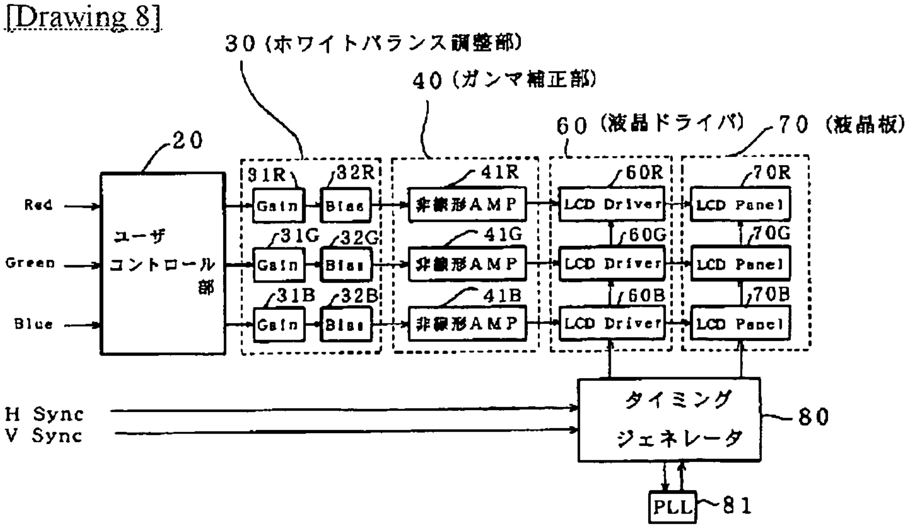


[Drawing 6]

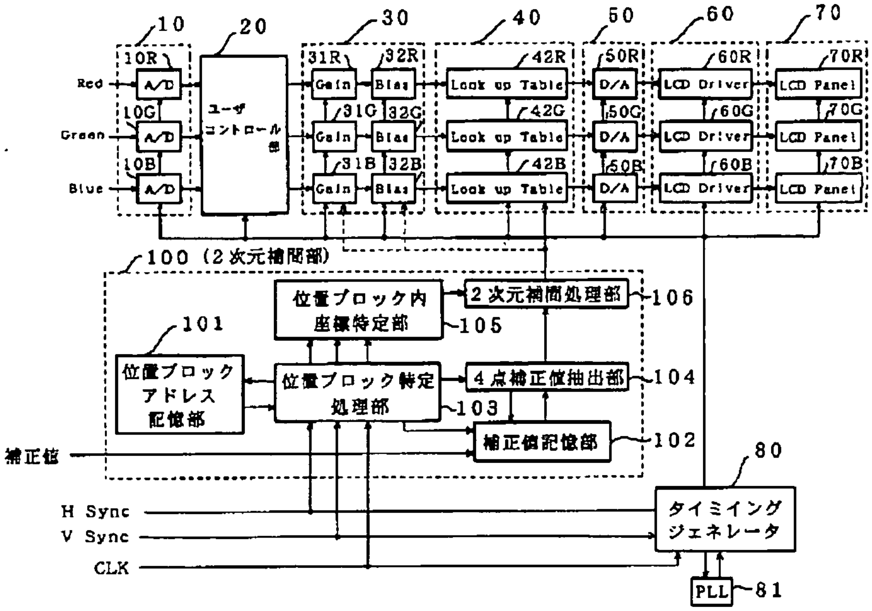


X 1 ≦ X ≦ X c かつ Y 1 ≦ Y ≦ Y c かつ Z 1 ≦ Z ≦ Z c

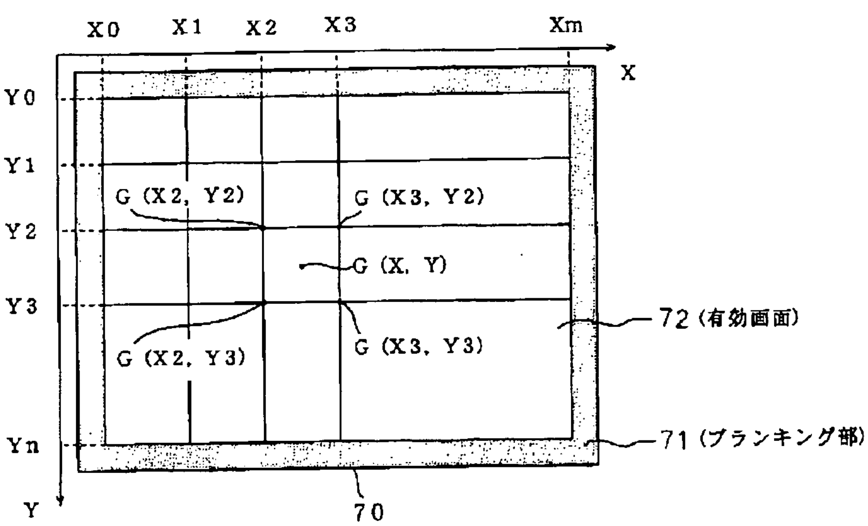
[Drawing 8]



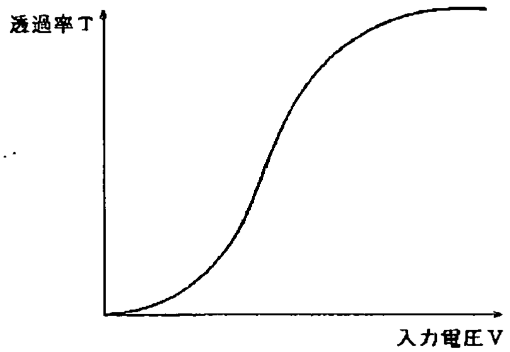
[Drawing 9]



[Drawing 10]



[Drawing 11]



ＬＣＤパネルの入力電圧Ｖと透過率Ｔの関係

[Translation done.]